IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1.   (currently amended) A virtualization system for controlling data transfer between a host system and a plurality of storage devices, each of the storage devices having a disk controller, a plurality of disk drives, and at least one logical volume relating to a portion of the disk drives, the virtualization system comprising:

a plurality of first ports coupled to the plurality of storage devices;

a second port coupled to the host system;

a processor; and

a memory configured to store mapping information which relates first volume identification information, used by the host system to access a virtual volume in the virtualization system, to second volume identification information for identifying a first logical volume corresponding to the virtual logical volume, -and the first logical volume being in a first storage device of the storage devices, the mapping information being used by the processor to transfer data sent from the host system to the first logical volume;

wherein the virtualization system receives data, which are sent from the host system and are targeted to the first volume identification information, during a data transfer phase in which that-data stored in the first logical volume are transferred to a second logical volume in a second storage device of the storage devices, and-the data targeted to the first volume identification information is written to the second logical volume; and

2

wherein, when the data transfer phase is completed, the memory is configured to store changed mapping information which relates the first volume identification information to third volume identification information for identifying the second logical volume.

2.   (previously presented) The virtualization system as recited in Claim 1, wherein, upon receipt of data targeted to the first volume identification information, the processor controls data transfer of the data targeted to the first volume identification information to the first logical volume based on the relation of volume identification information in the mapping information.

3.   (previously presented) The virtualization system as recited in Claim 1, wherein the second volume identification information includes a port identification of the first storage device related to the first logical volume and a Logical Unit Number (LUN) identifying the first logical volume.

4.   (previously presented) The virtualization system as recited in Claim 1, wherein the second volume identification information includes a identification number of the first logical volume.

5.   (previously presented) The virtualization system as recited in Claim 1, wherein the memory is configured to store routing information which indicates a relationship of connection among the virtualization system, the storage devices, and the host system;

wherein the processor, upon receipt of data from the host system or any of the storage devices, decides whether to relate identification information of the received data to the volume identification information stored in the mapping information or not, and if the identification information of the received data relates to the volume identification information, sends the received data to the host system or any of the storage devices according to the routing information.

6.   (canceled).

7.   (previously presented) The virtualization system as recited in Claim 1, wherein, when or after transfer of data stored in the first logical volume to the second logical volume is completed, if a request for access targeted to the first volume identification information is received from the host system, the processor sends a request corresponding to the request to the second storage device having the second logical volume.

8.   (previously amended) The virtualization system as recited in Claim 1, wherein the processor is configured to be sent the mapping information from another computer system.

9.   (previously amended) The virtualization system as recited in Claim 1, further comprising a third port for connection with a managing unit which is configured to control the virtualization system, wherein the processor is configured to monitor a state of connection with the storage devices connected through the plurality of first ports, and if a change in the connection

state is detected, to notify the managing unit of the change in the connection state.

10. (currently amended) A virtualization system coupled to at least one host system and a plurality of storage devices, said storage devices each having a plurality of disk drives and at least one logical volume related to a portion of the disk drive, the virtualization system comprising:

a plurality of first ports coupled to the storage devices;

at least one second port coupled to the host system; and

a first processor configured to convert first volume identification information, which is related to data received from the host system and is used to identify a virtual volume of the virtualization system, into second volume identification information for identifying a first logical volume in a first storage device of the storage devices according to relationship information between the first volume identification information and the second volume identification information, and to send data related to the second volume identification information to the first storage device;

wherein the virtualization system receives data, which is sent from the host system and is related to the first volume identification information, during a data transfer phase in which that data stored in the first logical volume are transferred to a second logical volume in a second storage device of the storage devices, and the received data is written to the second logical volume;

wherein, if the data transfer phase is completed, the relationship information is changed to new relationship information between the first volume identification information and third volume identification information for identifying the second logical volume;

5

wherein the first processor is configured to convert the first volume identification information, which is related to another data received from the host system, into the third volume identification information according to the new relationship information, and to send data related to the third volume identification information to the second storage device.

11.   (previously presented) The virtualization system as recited in Claim 10, wherein the second volume identification information includes a port identification of the first storage device and a Logical Unite Number (LUN) identifying the first logical volume.

12.   (previously presented) The virtualization system as recited in Claim 10, further comprising:

a second processor which controls the process of transferring data stored in a third logical volume corresponding to another virtual volume to a fourth logical volume, and

wherein if the process of transferring data is completed, fourth volume identification information, which is used to identify the another virtual volume, is related to the fifth volume identification information for identifying the fourth logical volume.

13.   (canceled).

14.   (previously amended) The virtualization system as recited in Claim 10, further comprising at least one third port coupled to a managing

unit, wherein the managing unit is configured to send the relationship information to the virtualization system.

15.   (canceled).

16.   (currently amended) A method of controlling data transfer in a virtualization system coupled to a host system and a plurality of storage devices, the host system using first volume identification information to access a virtual volume in the virtualization system, and each of the storage devices has having a plurality of disk drives and a logical volume related to a portion of the disk drives, the method comprising:

relating the first volume identification information for identifying the virtual logical volume to second volume identification information for identifying a first logical volume in a first storage device of the storage devices;

transferring data stored in the first logical volume to a second logical volume in a second storage device of the storage devices;

receiving data of a data input request sent from the host system during the transferring step, the data input request having by using the first volume identification information during the transferring step;.

writing the data of the data input request being written to the second logical volume; and

based upon transferring all data stored in the first logical volume to the second logical volume, relating the first volume identification information to

7

third volume identification information for identifying the second logical volume.

17. (previously presented) The method of controlling data transfer as recited in Claim 16, further comprising:

registering the first volume identification information and the third volume identification information in mapping information in a memory;

receiving a data input/output request, sent from the host system, and targeted to the virtual volume;

converting the first volume identification information related to the data input/output request into the third volume identification information; and

transferring the converted data input/output request to the second logical volume after registering the first volume identification information and the third volume identification information.

18. (previously presented) The method of controlling data transfer as recited in Claim 16, further comprising:

receiving a input/output request, which is sent from the host system and is targeted to the virtual volume; and

based upon transferring the all data stored in the first logical volume to the second logical volume, sending the input/output request to the second storage device after relating the first volume identification information to the third volume identification information.

19.   (currently amended) A method of controlling data transfer of a virtualization system, which couples to a host system, a first storage device and a second storage device and has a virtual volume related to a first logical volume related to a portion of a plurality of disk drives in the first storage device, the method comprising:

transferring data sent from the host system to the first logical volume after by-changing first volume identification information, which is related to the data sent from the host system and is used to identify the virtual volume, into second volume identification information for identifying the first logical volume;

transferring substantially all data from the first logical volume to a second logical volume related to a portion of a plurality of disk drives in the second storage device;

writing data sent from the host system during the transferring of substantially all data transfer-from the first logical volume to the second logical volume, to the second logical volume; and

setting-using a relationship between the first volume identification information and third volume identification information for identifying the second logical volume, if the transferring of substantially all data transfer-from the first logical volume to the second logical volume is completed; and

transferring another data sent from the host system to the second logical volume after changing the first volume identification information, which is related to the another data sent from the host system, into the third volume identification information after setting the relationship.

9

20.   (previously presented) The method as recited in Claim 19, further:

wherein virtual volume is related to virtual port identification information.

21.   (currently amended) The method as recited in Claim 19, wherein the another data sent from the host system is related to the first volume identification information and virtual port identification information of the virtualization system, and wherein transferring the another data sent from the host system to the second logical volume comprises sending the another data related to the third volume identification information and port identification information of the second storage device from the virtualization system to the second logical volume.

22.   (previously presented) The method as recited in Claim 19, wherein the first volume identification information relates to virtual port identification information of the virtualization system.

23.   (previously presented) The method as recited in Claim 19, wherein the first volume identification information and virtual port identification information of the virtualization system are used to identify the virtual volume.

24.   (currently amended) A method of controlling data transfer by a virtualization system coupled to a host system and a plurality of storage devices, the host system accesses accessing a virtual volume of the virtualization system, each of said storage devices has having a plurality of

10

disk drives and a logical volume related to a portion of the disk drives, the method comprising:

receiving a first request with a first volume identification information, which is used to identify the virtual volume, from the host system;

sending, based on the received ~~receiving the~~ first request, a second request with a second volume identification information, which is used to identify a first logical volume of a first storage device of the storage devices, to the first logical volume by using first relationship information between the first volume identification information and the second volume identification information;

receiving data requested by the second request from the first storage device;

sending the received data to the host system;

transferring data from the first logical volume to a second logical volume of a second storage device of the storage devices;

writing data sent from the host system during the transferring of data ~~transfer~~ from the first logical volume to the second logical volume, to the second logical volume; and

~~using~~storing~~using~~, for sending data targeted to the virtual volume, second relationship information between the first volume identification information and third volume identification information, which is used to identify the second logical volume, if the transferring of data ~~transfer~~ from the first logical volume to the second logical volume is completed,

11

receiving a third request with the first volume identification information

from the host system after the transferring of data transfer from the first logical

volume to a second logical volume is completed;

sending, based on the received receiving the third request, a fourth

request with a third volume identification information, which is used to identify

the second logical volume, to the second logical volume by using the second

relationship information;

receiving another data requested by the fourth request from the second

storage device; and

sending the received another data to the host system.

25.   (previously presented) The method of controlling data transfer

as recited in Claim 24, wherein the step of the data transfer from the first

logical volume to the second logical volume comprises:

receiving from a managing unit a command of the second relationship

storing the second relationship information based on the command.

26.   (previously presented) The method of controlling data transfer

as recited in Claim 24, further comprising:

storing the second relationship information.

27.   (previously presented)   The virtualization system as recited

in Claim 1, wherein the virtual volume corresponds to a virtual port of the

virtualization system.

28. (previously presented) The virtualization system as recited in Claim 1,

wherein the mapping information relates first port identification information of the virtualization system, used by the host system to access the virtual logical volume, to second port identification information for identifying a second port of the first storage device, and

wherein, based on that the data stored in the first logical volume are transferred to the second logical volume, the processor relates the first port identification information to a third port identification information for identifying a third port of the second storage device, and registers the third port identification information related to the first port identification information in the mapping information.

29. (previously presented) The virtualization system as recited in Claim 10, wherein the virtual volume corresponds to a virtual port of the virtualization system.

30. (previously presented) The virtualization system as recited in Claim 10, wherein the relationship information is further related first port identification information of the virtualization system, used by the host system to access the virtual volume, to second port identification information for identifying a second port of the first storage device, and

wherein, if the data transfer phase is completed, the new relationship information is related the first port identification information to a third port identification information for identifying a third port of the second storage device.

31.   (previously presented) The method of controlling data transfer as recited in Claim 16, wherein the virtual volume corresponds to a virtual port of the virtualization system.

32.   (previously presented) The method of controlling data transfer as recited in Claim 16, further comprising:

relating first port identification information of the virtualization system, used by the host system to access the virtual volume, to second port identification information for identifying a second port of the first storage device, and

based upon transferring the all data stored in the first logical volume to the second logical volume, relating the first port identification information to a third port identification information for identifying a third port of the second storage device.

33.   (previously presented) The virtualization system as recited in Claim 1, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

34.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

the virtualization system including a switch having the first ports, the second port, the processor and the memory.

35.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

a processing circuit configured to convert the first volume identification information, which is related to data received from the host system, into the third volume identification information according to the changed mapping information and to send data related to the third volume identification information to the second storage device.

36.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

a processing circuit configured to convert the first volume identification information, which is related to data received from the host system, into the third volume identification information according to the changed mapping information and to send data related to the third volume identification information to the second storage device

another processing circuit configured to convert fourth volume identification information, which is related to data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices according to mapping information between the fourth volume identification information and the fifth volume identification information and to send data related to the fifth volume identification information to the third storage device.

37.   (previously presented) The virtualization system as recited in Claim 10, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

38.   (previously presented) The virtualization system as recited in Claim 10, further comprising:

the virtualization system including a switch having the first ports, the second port and the first processor.

39.   (previously presented) The virtualization system as recited in Claim 10, further comprising:

a second processor configured to convert fourth volume identification information, which is related to data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices according to relationship information between the fourth volume identification information and the fifth volume identification information and to send data related to the fifth volume identification information to the third storage device.

40.   (previously presented) The method of controlling data transfer as recited in Claim 16, wherein the first volume identification information includes a Logical Unit Number (LUN) identifying the virtual volume and is related to a virtual port identification information of the virtualization system.

16

41. (previously presented) The method of controlling data transfer as recited in Claim 16, wherein:

the virtualization system is a switch system.

42. (previously presented) The method of controlling data transfer as recited in Claim 16, wherein:

receiving, by the virtualization system, a first data input/output request, which is sent from the host system and is targeted to the virtual volume;

converting, by control of a first processing circuit in the virtualization system, the first volume identification information related to the first data input/output request into the third volume identification information after relating the first volume identification information to the third volume identification information;

transferring, by control of the first processing circuit, the converted first data input/output request to the second logical volume;

receiving, by the virtualization system, a second data input/output request, which is sent from the host system or another host system and is targeted to another virtual volume;

converting, by control of a second processing circuit in the virtualization system, a fourth volume identification information, which is used to identify the another virtual volume and is related to the second data input/output request, into a fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices;

transferring, by control of the second processing circuit, the converted second data input/output request to the third logical volume.

43. (previously presented) The method as recited in Claim 19, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual logical volume and is related to a virtual port identification information of the virtual volume.

44. (previously presented) The method as recited in Claim 19, wherein:

the virtualization system is a switch system.

45. (previously presented) The method as recited in Claim 19, wherein:

receiving, by the virtualization system, a first data input/output request, which is sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization system, the first volume identification information of the first data input/output request into the third volume identification information after setting the relationship;

transferring, by control of the first processing circuit, the changed first data input/output request to the second logical volume;

receiving, by the virtualization system, a second data input/output request, which is sent from the host system or another host system and is targeted to another virtual volume;

changing, by control of a second processing circuit in the virtualization system, a fourth volume identification information, which is used to identify the another virtual volume and is related to the second data input/output request,

into a fifth volume identification information for identifying a third logical volume in a third storage device;

transferring, by control of the second processing circuit, the changed second data input/output request to the third logical volume.

46   (previously presented) The method of controlling data transfer as recited in Claim 24, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

47.   (previously presented) The method as recited in Claim 24, wherein:

the virtualization system is a switch system.

48.   (previously presented) The method as recited in Claim 24, wherein:

receiving, by fifth request, which is sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization system, the first volume identification information related to the fifth request into the third volume identification information based on the second relationship information so that a sixth request with the third volume identification information is created based on the fifth request;

transferring, by control of the first processing circuit, the sixth request to the second logical volume;

19

receiving, by the virtualization system, a seventh request, which is sent from the host system or another host system and is targeted to another virtual volume;

changing, by a second processing circuit in the virtualization system, a fourth volume identification information, which is used to identify the another virtual volume and is related to the seventh request, into a fifth volume identification information for identifying a third logical volume in a third storage device so that a eighth request with the fifth volume identification information is created based on the seventh request;

transferring, by the second processing circuit, the eighth request to the third logical volume.